

What is claimed is:

1. A precleaner arrangement for separating a portion of entrained material from  
air flow air entering an engine air cleaner; the precleaner arrangement  
5 comprising:
  - (a) a vane structure arrangement including at least a first, adjustable, air  
deflection vane;
    - (i) the first, adjustable, air deflection vane having a flexible  
portion deflectable between a first orientation and a second  
10 orientation;
    - (ii) the flexible portion having a memory bias toward the first  
orientation; and,
    - (iii) the flexible portion being configured to deflect toward the  
second orientation, in response to a sufficient air flow rate  
15 increase through the precleaner arrangement, in use.
2. A precleaner arrangement according to claim 1 wherein:
  - (a) the vane structure arrangement comprises a plurality of adjustable air  
deflection vanes positioned around a central hub;  
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    - (i) each adjustable air deflection vane having a flexible portion  
deflectable between a first orientation and a second  
orientation;
    - (ii) each flexible portion having a memory bias toward a first  
orientation; and,
    - (iii) each flexible portion being configured to deflect toward the  
25 second orientation in response to a sufficient air flow rate  
increase through the precleaner arrangement, in use.
3. A precleaner arrangement according to claim 2 wherein:  
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  - (a) each adjustable air deflection vane comprises:
    - (i) a flexible member; and,
    - (ii) a rigid structural member.

4. A precleaner arrangement according to claim 3 wherein:  
(a) the vane structure arrangement includes at least three adjustable air deflection vanes.
- 5 5. A precleaner arrangement according to claim 4 wherein:  
(a) the vane structure has a first axial total vane length X and a first vane perimeter size Y;  
(b) the precleaner being configured such  $X < Y$ .
- 10 6. A precleaner arrangement according to claim 5 wherein:  
 $X < 0.7Y$
7. A precleaner arrangement according to claim 6 wherein:  
 $X < 0.3Y$
- 15 8. A precleaner arrangement according to claim 4 wherein:  
(a) the vane structure includes a perimeter rim:  
(i) each adjustable air deflection vane being secured in extension between the central hub and the perimeter rim; and  
(ii) a perimeter edge portion of each flexible portion being spaced from the perimeter rim, to define a flexible, downstream, outer ear in the associated flexible portion.
- 20 9. A precleaner arrangement according to claim 8 wherein:  
(a) each adjustable air deflection vane has: a lead, upstream, edge; and, a tail, downstream, edge; and  
(b) the flexible member has a concave upstream surface in extension between the lead edge and the tail edge, when in the first orientation.
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10. A precleaner arrangement according to claim 9 having:
- (a) a projection angle A between the lead upstream edge of each adjustable air deflection vane and a tail edge of a next adjacent air deflection vane of at least 17°.
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11. A precleaner arrangement according to claim 8 wherein:
- (a) the vane structure arrangement is secured to a perimeter housing structure having a dust drop tube.
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12. An air cleaner comprising:
- (a) a precleaner arrangement comprising a vane structure arrangement including a plurality of adjustable, air deflection vanes;
    - (i) each adjustable air deflection vane having:
      - (A) a flexible member; and,
      - (B) a rigid structural member;
    - (ii) each flexible member being deflectable between a first orientation and a second orientation;
    - (iii) each flexible member having a memory bias toward the first orientation; and
    - (iv) the flexible member being configured to deflect toward the second orientation, in response to a sufficient air flow rate increase through the precleaner arrangement, in use; and
  - (b) a main air cleaner positioned to receive air from the precleaner arrangement;
    - (i) the main air cleaner having a serviceable air filter element therein.
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13. An air cleaner arrangement according to claim 12 wherein:
- (a) the serviceable air filter element comprises z-filter media.
14. A method of operating a precleaner to separate a portion of entrained

material from air flow entering an engine air cleaner; the method including steps of:

- 5        (a)     directing air through air deflection vanes of a vane structure of the precleaner at a first flow rate; and
  - (b)     increasing air flow from the first flow rate to a second, higher, flow rate while adjusting configuration of selected vanes in the vane structure by deforming flexible portions of the vanes toward a downstream direction in response to the second, higher, flow rate.
- 10    15.    A method of manufacturing a vane structure arrangement of a precleaner; the method including steps of:
- (a)     injecting a first material into a mold arrangement, to form a support structure; and,
  - 15       (b)     injecting a second moldable material, into contact with the first material, to form flexible vane portions configured to deflect toward a downstream direction in response to a sufficient air flow rate increase through the vane structure arrangement of the precleaner.